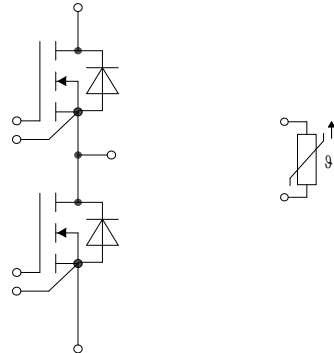
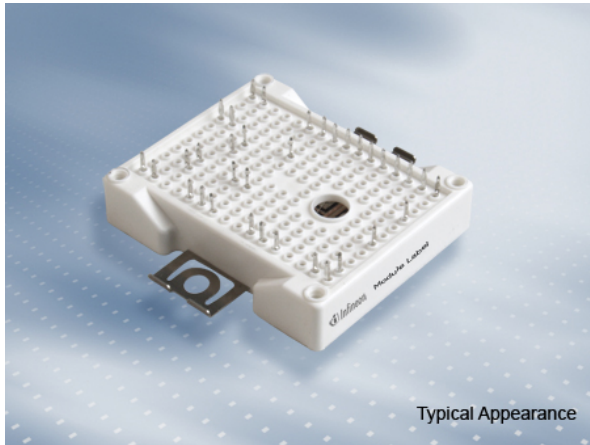


EasyDUAL 模块 采用 CoolSiC™ Trench MOSFET 带有pressfit压接管脚和温度检测NTC / TIM
 EasyDUAL module with CoolSiC™ Trench MOSFET and PressFIT / NTC / TIM

初步数据 / Preliminary Data



$V_{DSS} = 1200V$
 $I_{D\ nom} = 150A / I_{DRM} = 300A$

潜在应用

- DC/DC 变换器
- UPS系统
- 太阳能应用
- 高频开关应用

Potential Applications

- DC/DC converter
- UPS systems
- Solar applications
- High Frequency Switching application

电气特性

- 低开关损耗
- 低电感设计
- 高电流密度

Electrical Features

- Low switching losses
- Low inductive design
- High current density

机械特性

- PressFIT 压接技术
- 集成NTC温度传感器
- 集成的安装夹使安装坚固
- 预涂导热介质

Mechanical Features

- PressFIT contact technology
- Integrated NTC temperature sensor
- Rugged mounting due to integrated mounting clamps
- Pre-applied Thermal Interface Material

Module Label Code

Barcode Code 128



DMX - Code



Content of the Code

Content of the Code	Digit
Module Serial Number	1 - 5
Module Material Number	6 - 11
Production Order Number	12 - 19
Datecode (Production Year)	20 - 21
Datecode (Production Week)	22 - 23

初步数据
 Preliminary Data

MOSFET / MOSFET

最大额定值 / Maximum Rated Values

漏源极电压 Drain-source voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{DSS}	1200	V
直流漏极电流 DC drain current	$T_{vj} = 175^{\circ}\text{C}, V_{GS} = 15\text{ V}$	$T_H = 40^{\circ}\text{C}$	$I_{D\text{ nom}}$	150 A
脉冲漏极电流 Pulsed drain current	经设计验证, t_p 由 $T_{vj\text{ max}}$ 限定 verified by design, t_p limited by $T_{vj\text{ max}}$		$I_{D\text{ pulse}}$	300 A
栅源峰值电压 Gate-source voltage		V_{GSS}	-10 / 20	V

特征值 / Characteristic Values

		min. typ. max.			
漏源通态电阻 Drain-source on resistance	$I_D = 150\text{ A}$ $V_{GS} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$R_{DS\text{ on}}$	7,50 9,83 11,0	m Ω
栅极阈值电压 Gate threshold voltage	$I_D = 60,0\text{ mA}, V_{DS} = V_{GS}, T_{vj} = 25^{\circ}\text{C}$ (tested after 1ms pulse at $V_{GS} = +20\text{ V}$)		$V_{GS(th)}$	3,45 4,50 5,55	V
总的栅极电荷 Total gate charge	$V_{GS} = -5\text{ V} / 15\text{ V}, V_{DS} = 800\text{ V}$		Q_G	0,372	μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,7	Ω
输入电容 Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}$ $V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, V_{AC} = 25\text{ mV}$		C_{iss}	11,0	nF
输出电容 Output capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}$ $V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, V_{AC} = 25\text{ mV}$		C_{oss}	0,66	nF
反向传输电容 Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}$ $V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, V_{AC} = 25\text{ mV}$		C_{rss}	0,084	nF
C_{oss} stored energy	$T_{vj} = 25^{\circ}\text{C}$ $V_{DS} = 800\text{ V}, V_{GS} = -5\text{ V} / 15\text{ V}$		E_{oss}	264	μJ
零栅电压漏极电流 Zero gate voltage drain current	$V_{DS} = 1200\text{ V}, V_{GS} = -5\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	I_{DSS}	0,60 530	μA
栅极漏电流 Gate-source leakage current	$V_{DS} = 0\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$	$V_{GS} = 20\text{ V}$ $V_{GS} = -10\text{ V}$	I_{GSS}	400	nA
开通延迟时间(电感负载) Turn on delay time, inductive load	$I_D = 150\text{ A}, V_{DS} = 600\text{ V}$ $V_{GS} = -5\text{ V} / 15\text{ V}$ $R_{Gon} = 2,40\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\text{ on}}$	21,5 20,0 19,5	ns
上升时间(电感负载) Rise time, inductive load	$I_D = 150\text{ A}, V_{DS} = 600\text{ V}$ $V_{GS} = -5\text{ V} / 15\text{ V}$ $R_{Gon} = 2,40\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	16,5 16,0 16,0	ns
关断延迟时间(电感负载) Turn off delay time, inductive load	$I_D = 150\text{ A}, V_{DS} = 600\text{ V}$ $V_{GS} = -5\text{ V} / 15\text{ V}$ $R_{Goff} = 2,40\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\text{ off}}$	57,0 61,0 61,0	ns
下降时间(电感负载) Fall time, inductive load	$I_D = 150\text{ A}, V_{DS} = 600\text{ V}$ $V_{GS} = -5\text{ V} / 15\text{ V}$ $R_{Goff} = 2,40\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	28,0 28,5 28,5	ns
开通损耗(每脉冲) Turn-on energy loss per pulse	$I_D = 150\text{ A}, V_{DS} = 600\text{ V}, L\sigma = 35\text{ nH}$ $di/dt = 11,0\text{ kA}/\mu\text{s}$ ($T_{vj} = 150^{\circ}\text{C}$) $V_{GS} = -5\text{ V} / 15\text{ V}, R_{Gon} = 2,40\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	2,00 2,10 2,20	mJ
关断损耗(每脉冲) Turn-off energy loss per pulse	$I_D = 150\text{ A}, V_{DS} = 600\text{ V}, L\sigma = 35\text{ nH}$ $du/dt = 25,0\text{ kV}/\mu\text{s}$ ($T_{vj} = 150^{\circ}\text{C}$) $V_{GS} = -5\text{ V} / 15\text{ V}, R_{Goff} = 2,40\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	0,76 0,77 0,77	mJ
短路数据 SC data	$V_{GS} = -5\text{ V} / 15\text{ V}, V_{DD} = 800\text{ V}$ $V_{DS\text{ max}} = V_{DSS} - L_{SDS} \cdot di/dt$ $R_G = 10,0\ \Omega$	$t_p \leq 2\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$ $t_p \leq 2\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	1260 1230	A A
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个MOSFET / per MOSFET		R_{thJH}	0,314	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40 150	$^{\circ}\text{C}$

Body diode

最大额定值 / Maximum Rated Values

DC body diode forward current	$T_{vj} = 175^{\circ}\text{C}, V_{GS} = -5\text{ V}$	$T_H = 40^{\circ}\text{C}$	I_{SD}	48	A
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特征值 / Characteristic Values

		min. typ. max.			
正向电压 Forward voltage	$I_{SD} = 150\text{ A}, V_{GS} = -5\text{ V}$ $I_{SD} = 150\text{ A}, V_{GS} = -5\text{ V}$ $I_{SD} = 150\text{ A}, V_{GS} = -5\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_{SD}	4,60 4,35 4,30	5,65 V

初步数据
Preliminary Data

负温度系数热敏电阻 / NTC-Thermistor
特征值 / Characteristic Values

			min.	typ.	max.	
额定电阻值 Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		k Ω
R100 偏差 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
耗散功率 Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/100}$		3433		K

根据应用手册标定

Specification according to the valid application note.

模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		3,0		kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)			Al_2O_3		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			11,5 6,3		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			10,0 5,0		mm
相对电痕指数 Comperative tracking index		CTI		> 200		
相对温度指数 (电) RTI Elec.	住房 housing	RTI		140		$^{\circ}\text{C}$
min. typ. max.						
杂散电感, 模块 Stray inductance module		L_{sCE}		8,0		nH
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	$T_H = 25^{\circ}\text{C}$, 每个开关 / per switch	$R_{CC+EE'}$		0,50		m Ω
储存温度 Storage temperature		T_{stg}	-40		125	$^{\circ}\text{C}$
最高基板工作温度 Maximum baseplate operation temperature		T_{BPmax}			125	$^{\circ}\text{C}$
Anpresskraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80	N
重量 Weight		G		39		g

The current under continuous operation is limited to 25 A rms per connector pin.

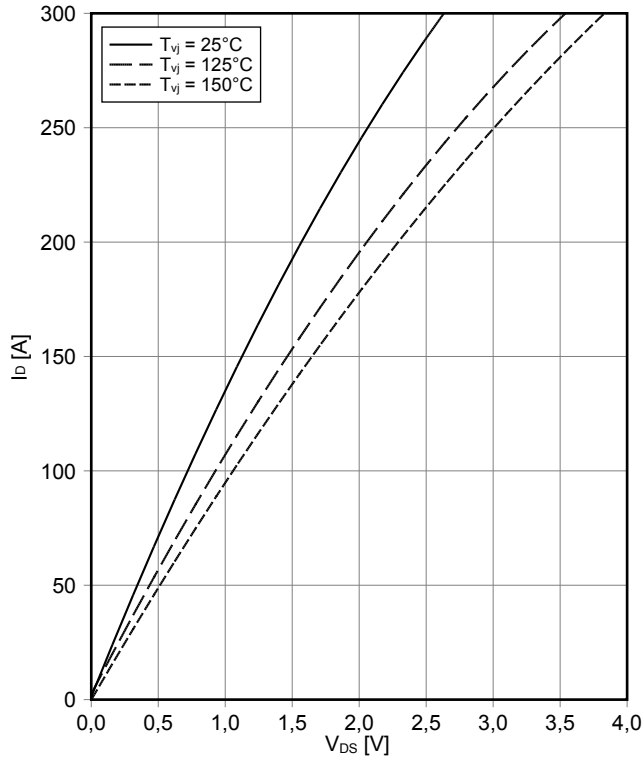
Important note: The selection of positive and negative gate-source voltages impacts the long-term behavior of the device. The design guidelines described in AN 2018-09 must be considered to ensure sound operation of the device over the planned lifetime.

Storage and shipment of modules with TIM => see AN2012-07

初步数据 Preliminary Data

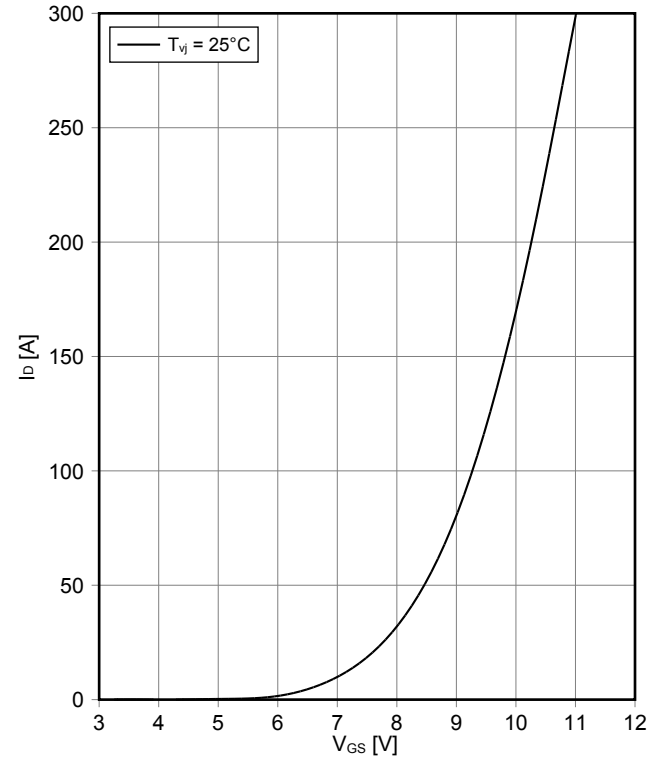
输出特性 MOSFET (典型)
output characteristic MOSFET (typical)

$I_D = f(V_{DS})$
 $V_{GS} = 15\text{ V}$



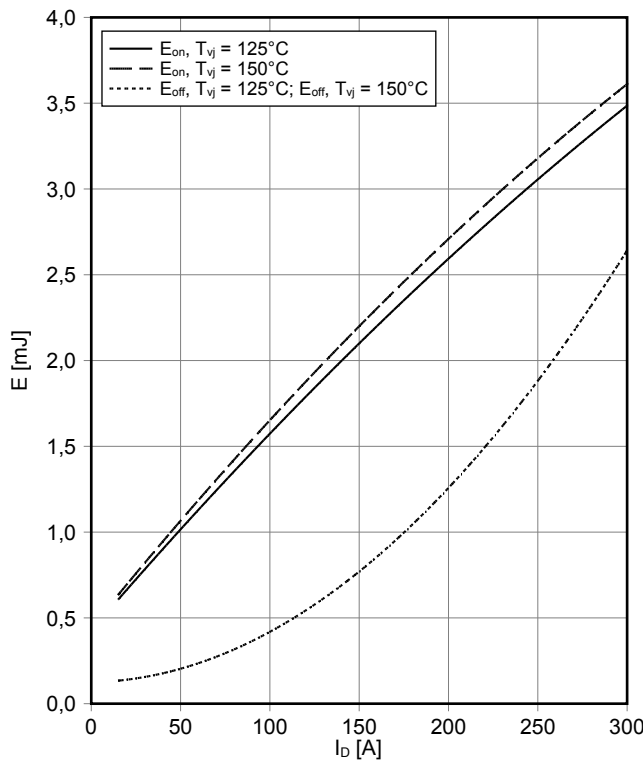
传输特性 MOSFET (典型)
transfer characteristic MOSFET (typical)

$I_D = f(V_{GS})$
 $V_{DS} = 20\text{ V}$



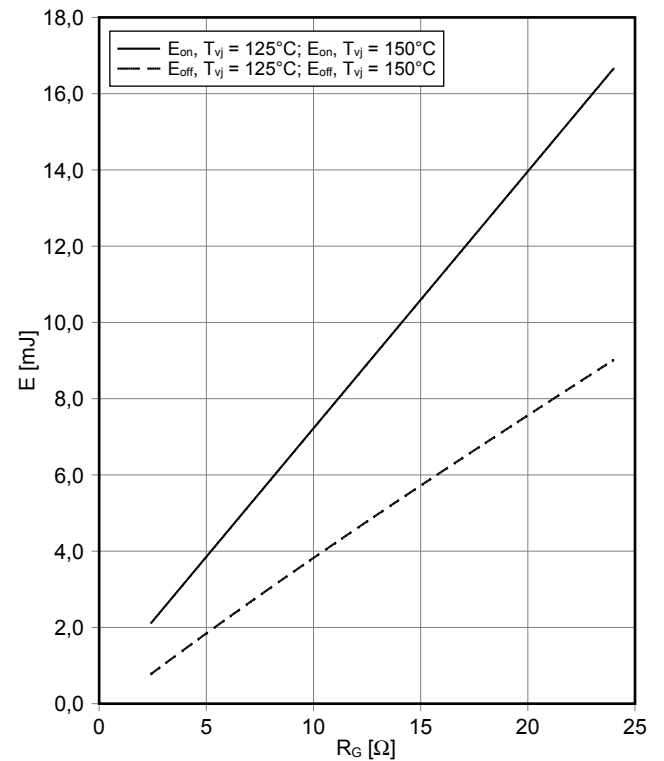
开关损耗 MOSFET (典型)
switching losses MOSFET (typical)

$E_{on} = f(I_D), E_{off} = f(I_D)$
 $V_{GS} = -5\text{ V} / 15\text{ V}, R_{Gon} = 2,4\ \Omega, R_{Goff} = 2,4\ \Omega, V_{DS} = 600\text{ V}$



开关损耗 MOSFET (典型)
switching losses MOSFET (typical)

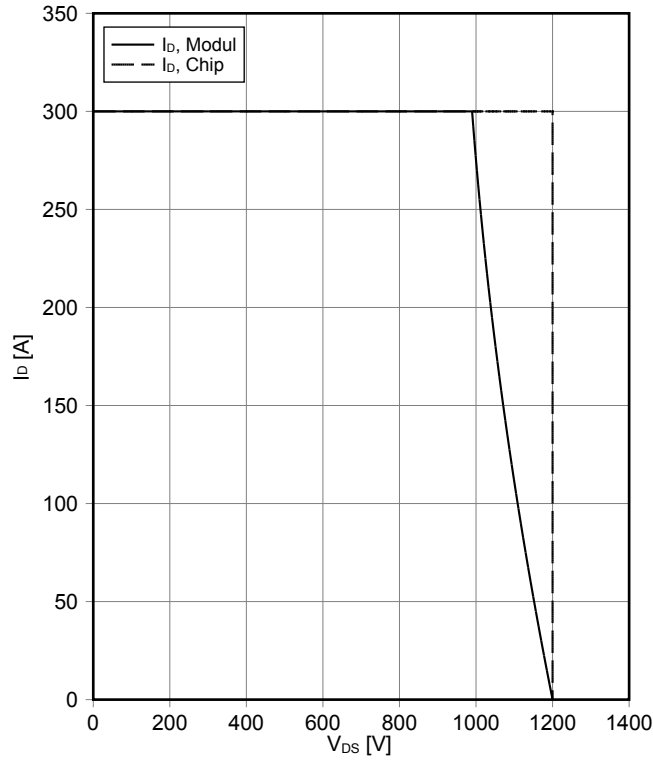
$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GS} = -5\text{ V} / 15\text{ V}, I_D = 150\text{ A}, V_{DS} = 600\text{ V}$



初步数据 Preliminary Data

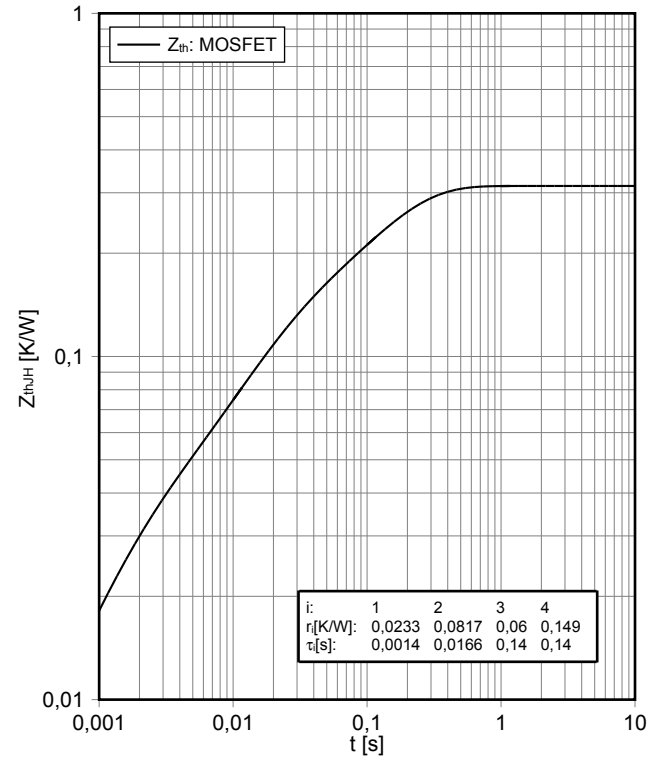
反偏安全工作区 MOSFET (RBSOA)
reverse bias safe operating area MOSFET (RBSOA)

$I_D = f(V_{DS})$
 $V_{GS} = -5\text{ V} / +15\text{ V}$, $T_{vj} = 150^\circ\text{C}$, $R_G = 2,4\ \Omega$



瞬态热阻抗 MOSFET
transient thermal impedance MOSFET

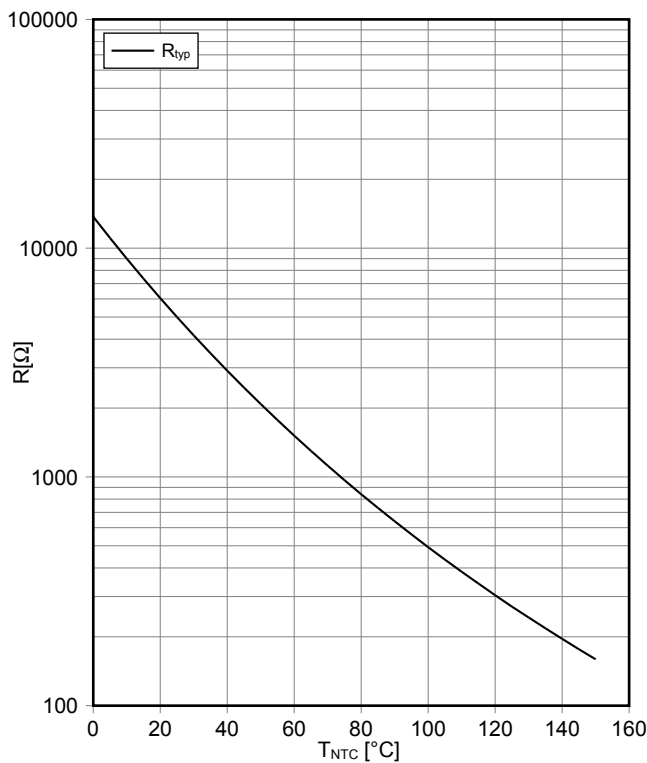
$Z_{thJH} = f(t)$



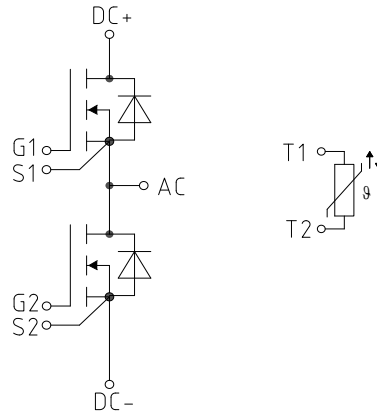
i:	1	2	3	4
r [K/W]:	0,0233	0,0817	0,06	0,149
τ [s]:	0,0014	0,0166	0,14	0,14

负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)

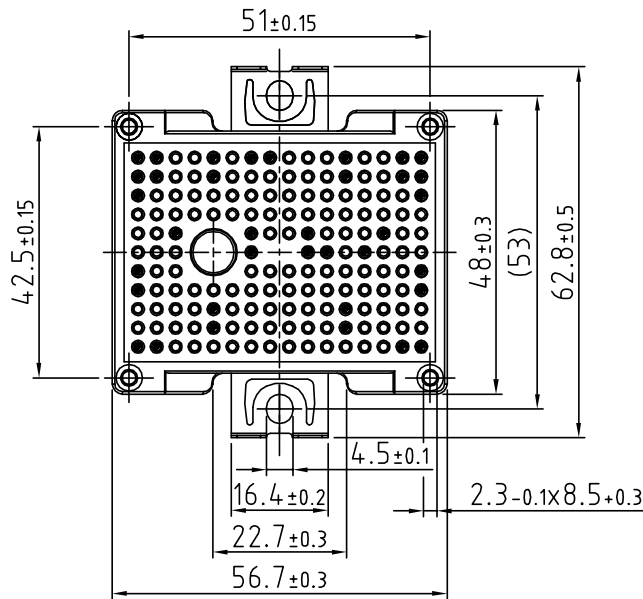
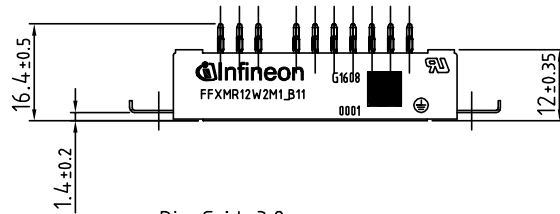
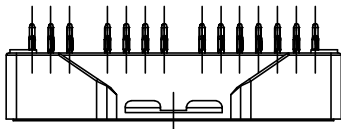
$R = f(T_{NTC})$



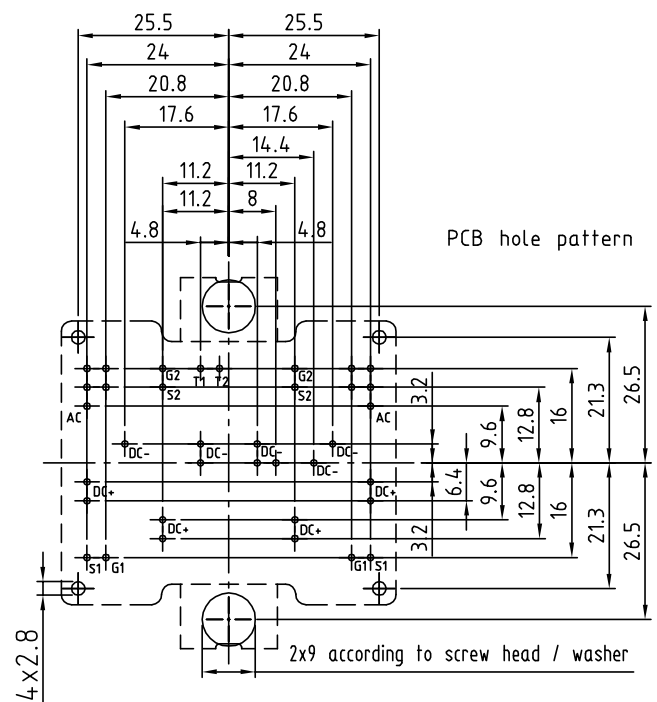
接线图 / Circuit diagram



封装尺寸 / Package outlines



- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern $\begin{matrix} \oplus \\ \ominus \end{matrix} \phi 0.1$
- Hole specification for contacts see AN 2009-01:
Diameters of drill $\phi 1.15\text{mm}$
and copper thickness in hole 25-50 μm



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